



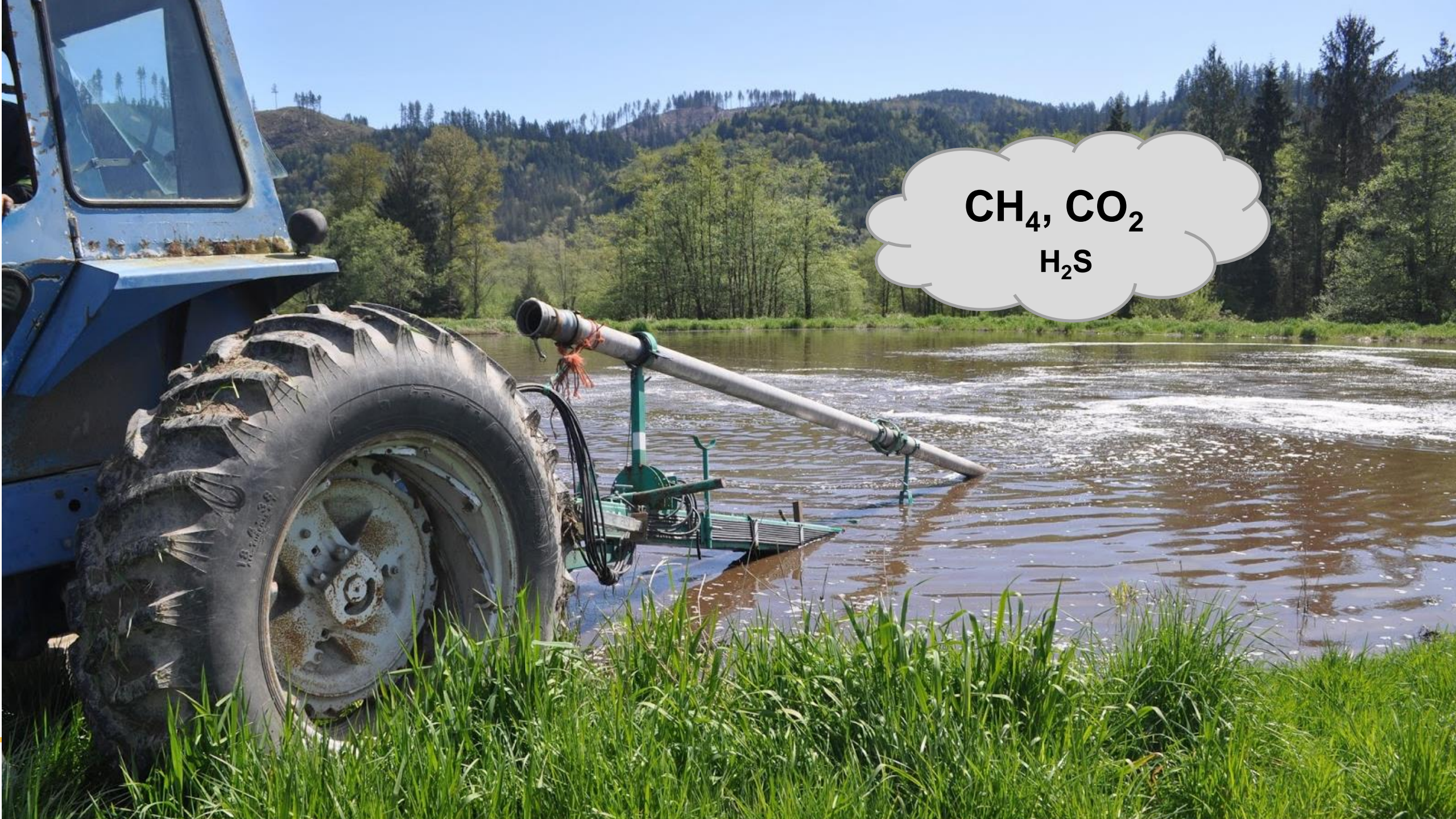
Beyond Biogas: Upcycling Wet Wastes

Joseph A. Rollin, Ph.D.

Special Government Employee (Former Fellow)

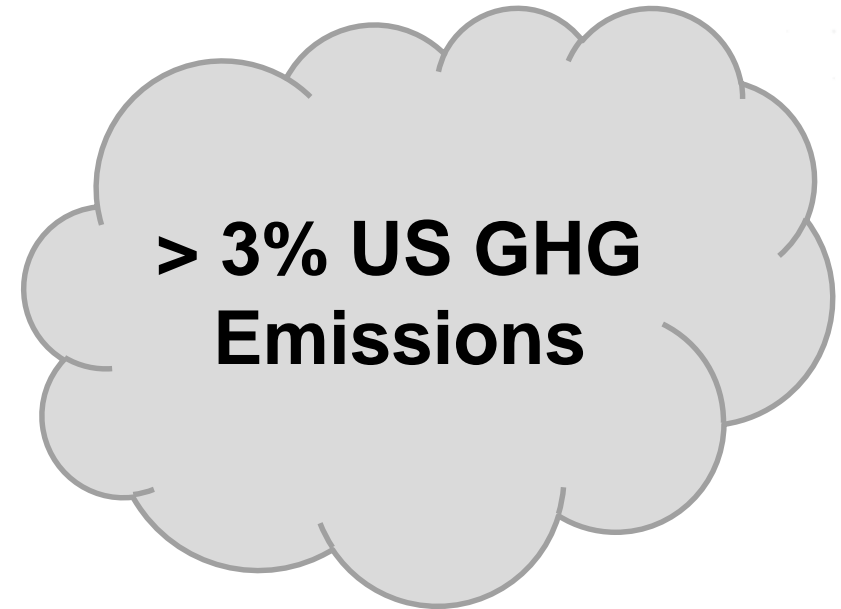
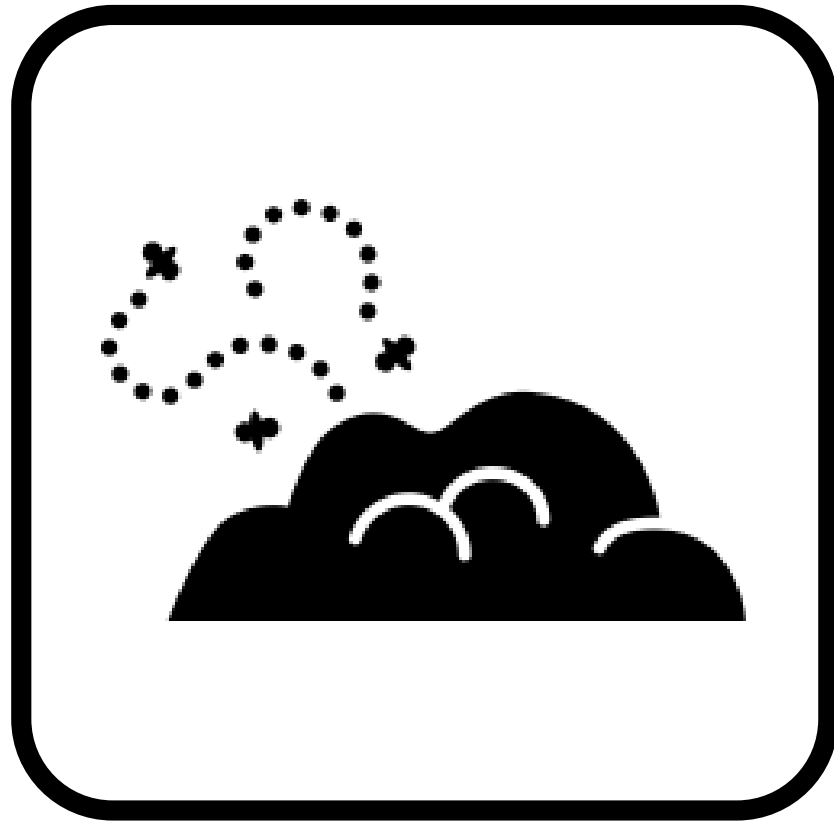
February 28, 2017



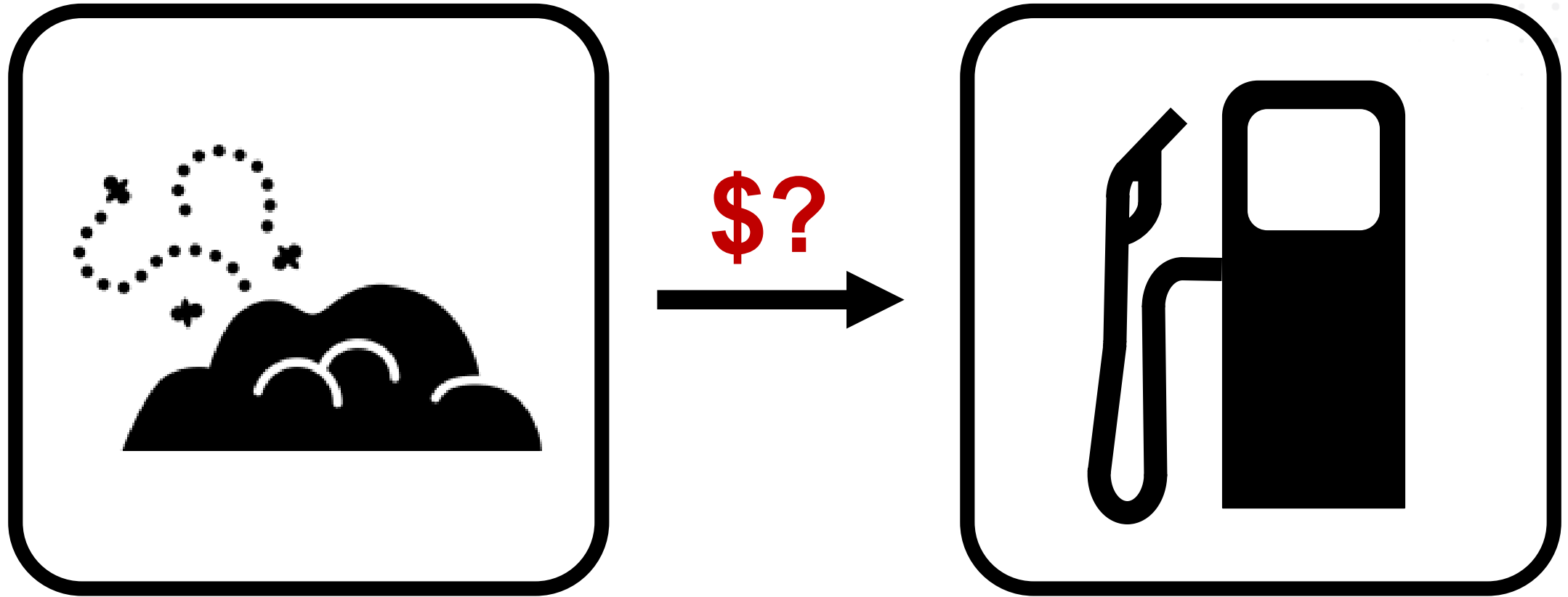


CH_4 , CO_2
 H_2S

Beyond Biogas – A Potential ARPA-E Program

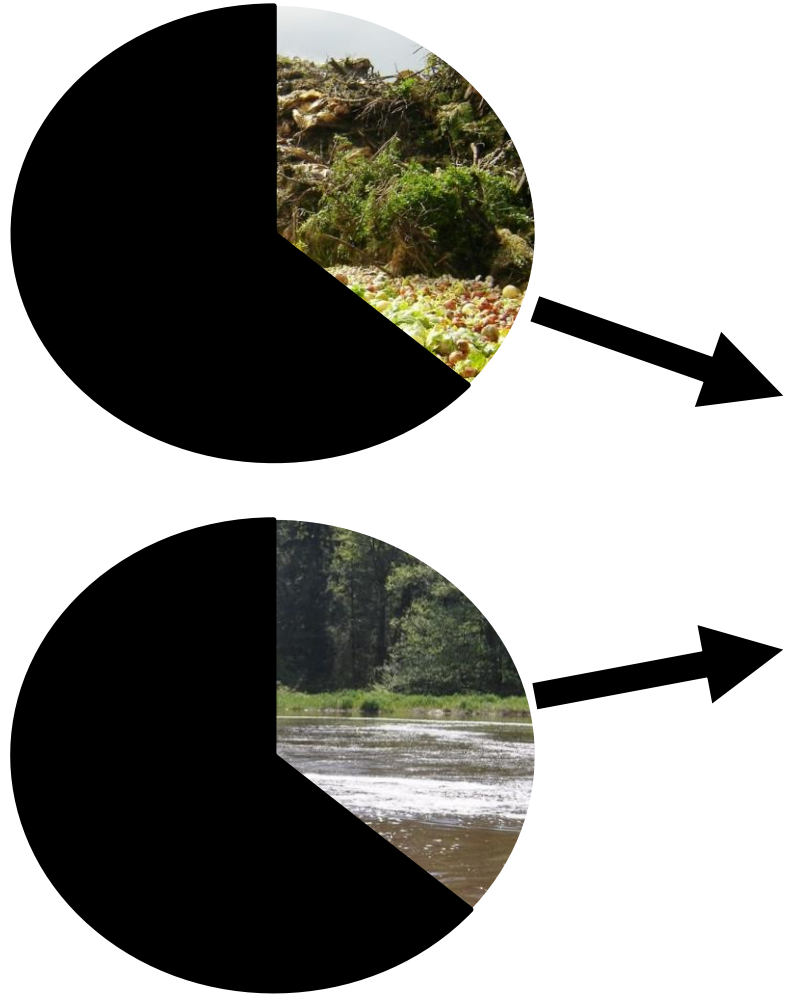


Beyond Biogas – A Potential ARPA-E Program

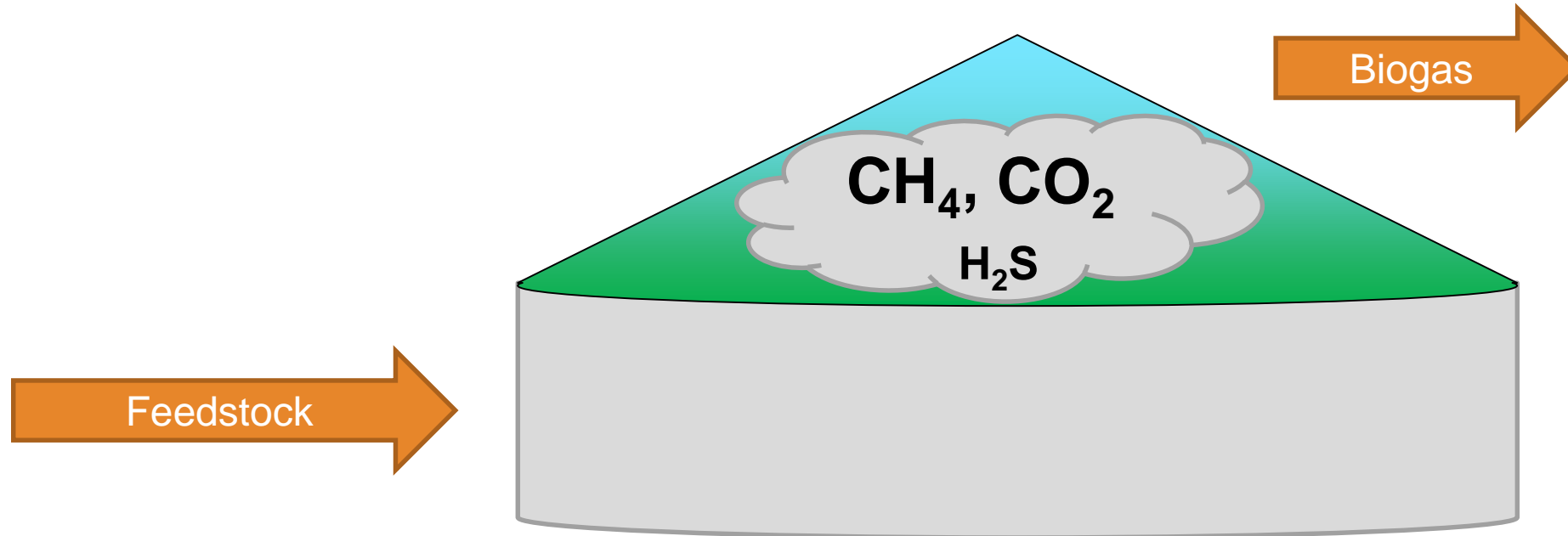


Wet feedstocks could produce 15% of America's fuel

Current Wet Waste Conversion – Anaerobic Digestion



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Current Wet Waste Conversion – Anaerobic Digestion

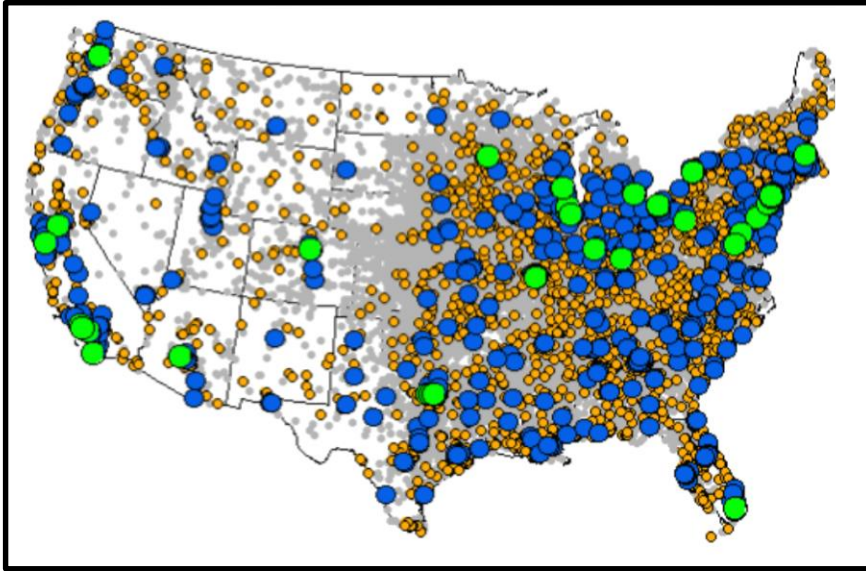
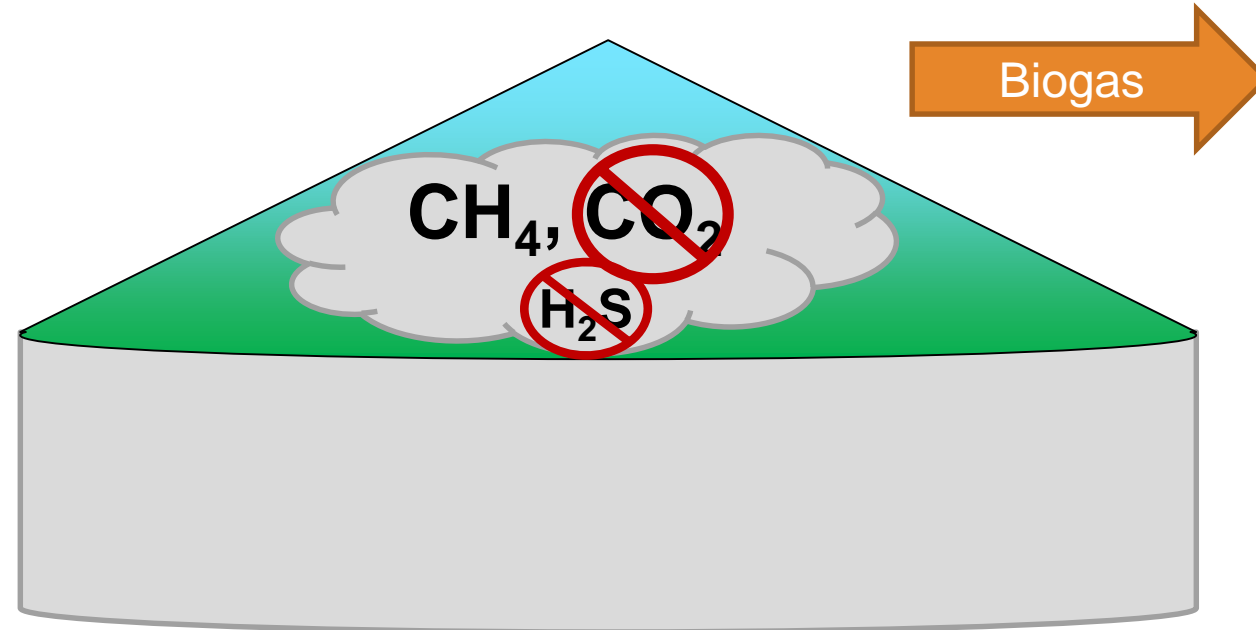


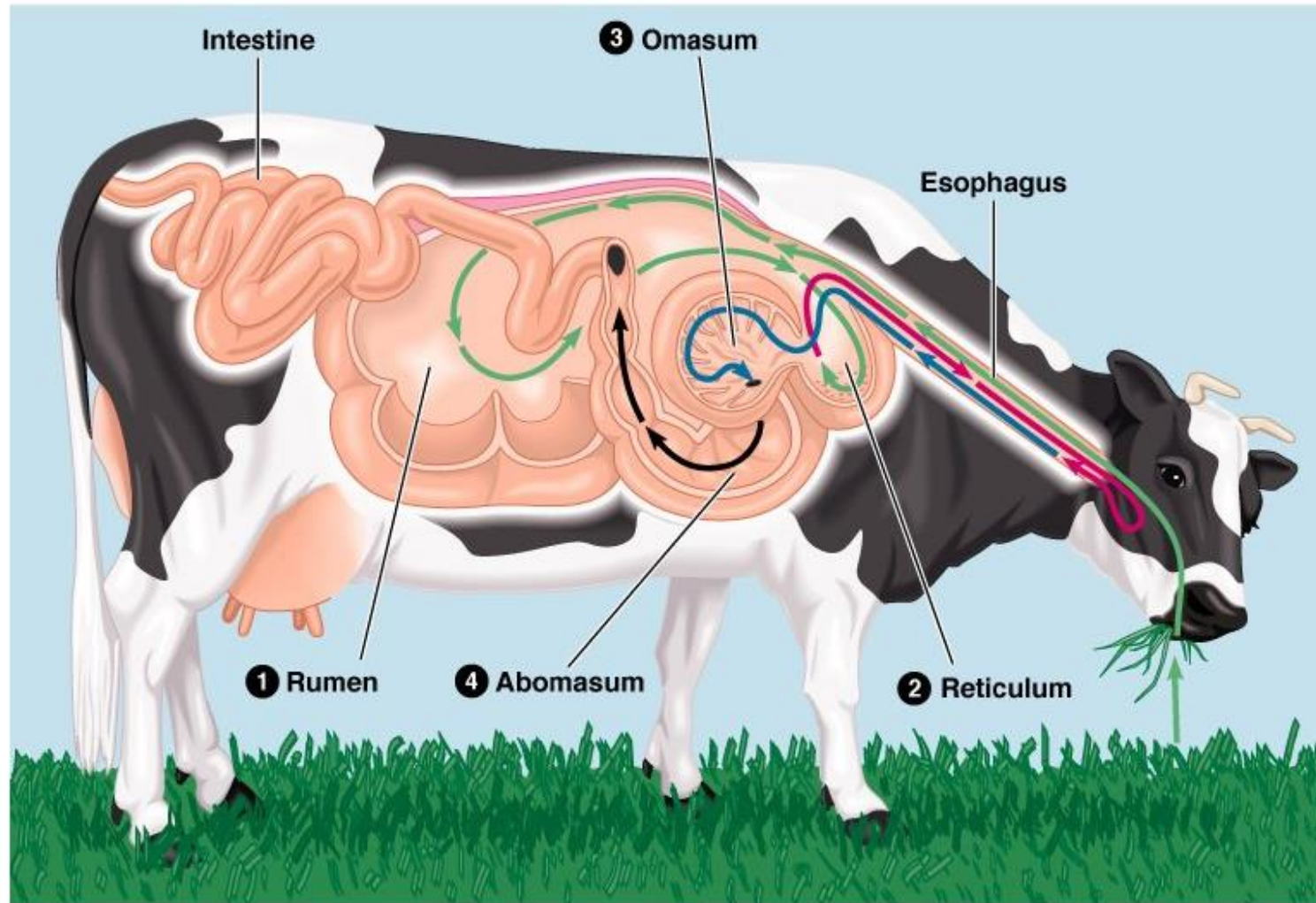
Image from Biofuels and Bioproducts from
Wet and Gaseous Waste Streams:
Challenges and Opportunities (2017) US
Department of Energy

Feedstock



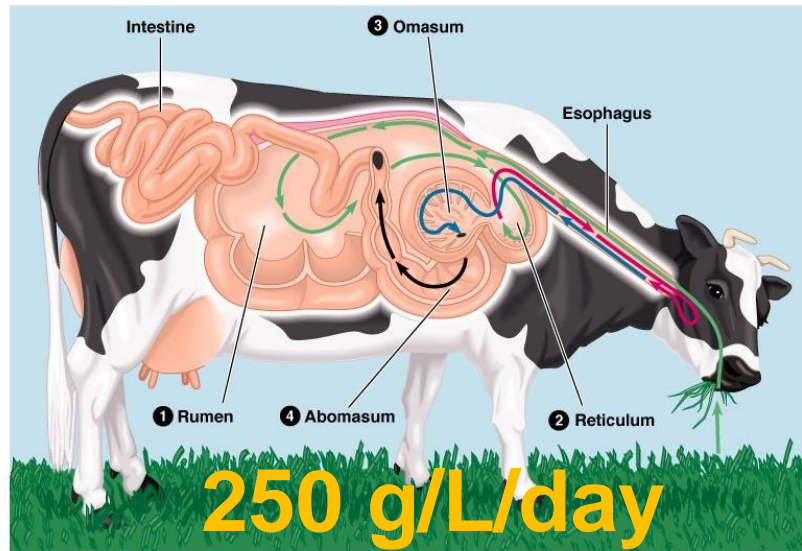
Natural Gas	\$2.50 - 3.50 / million BTU
Biogas	\$6.00 - 13.00 / million BTU

A Bioreactor Millennia in the Making

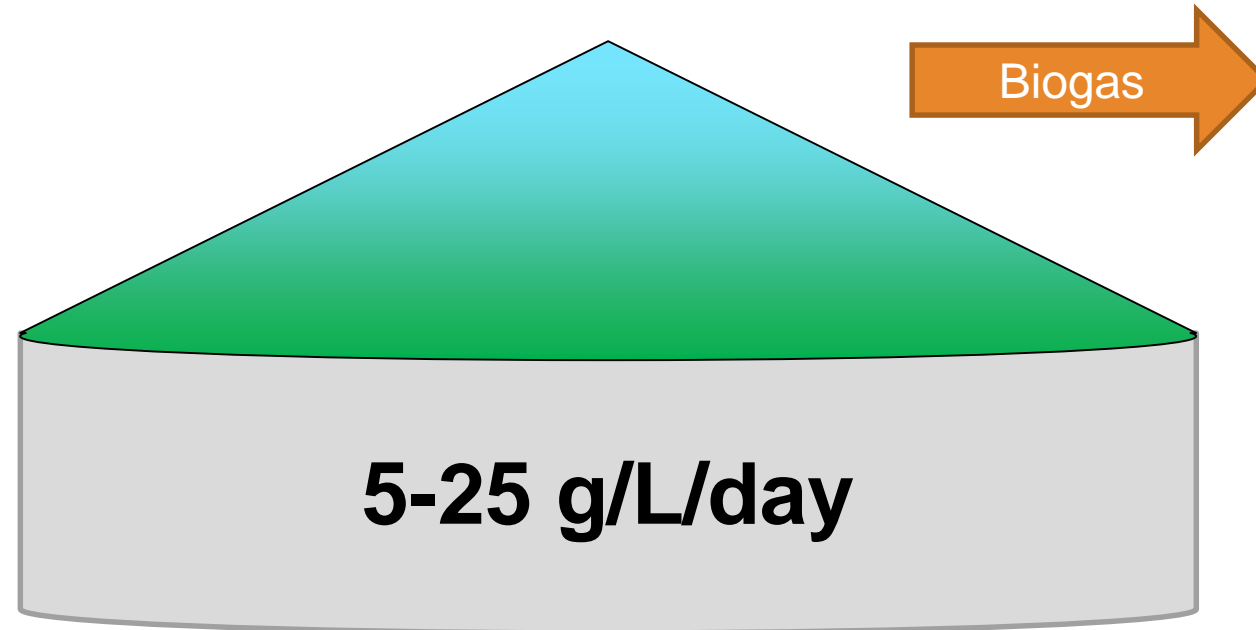


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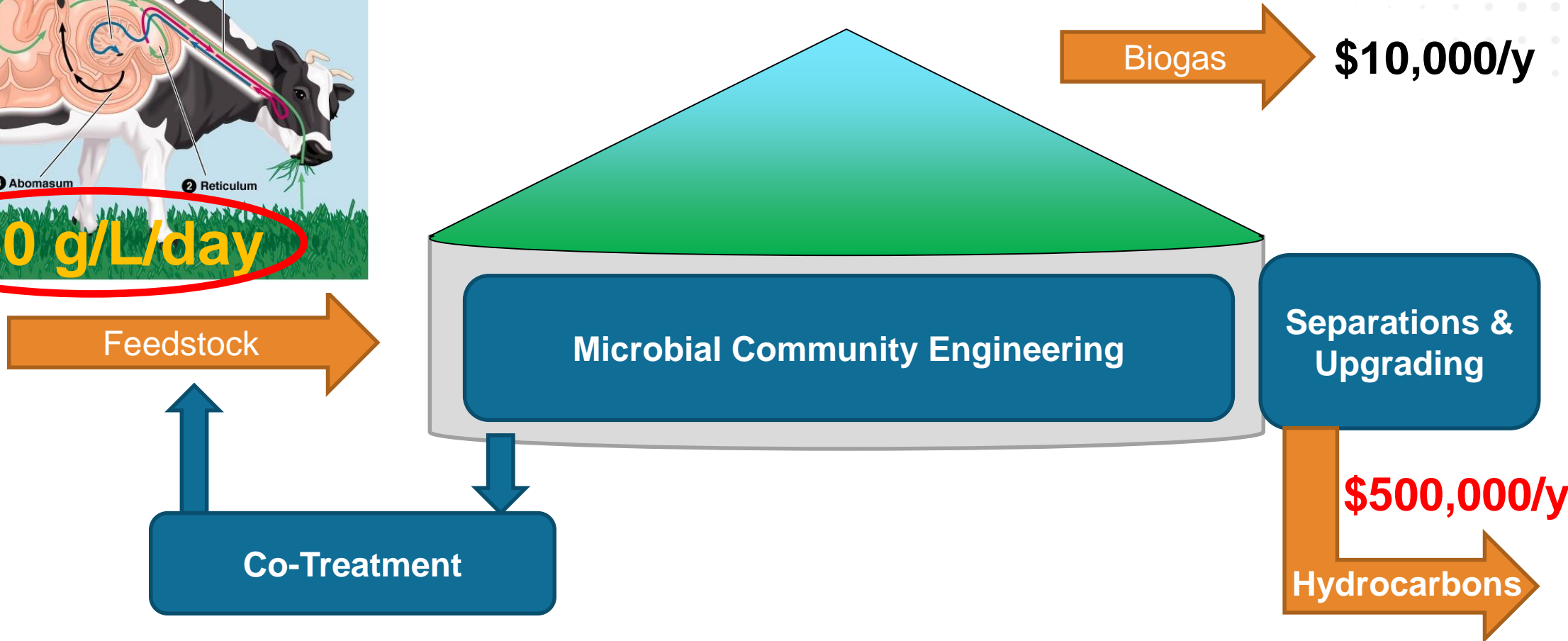
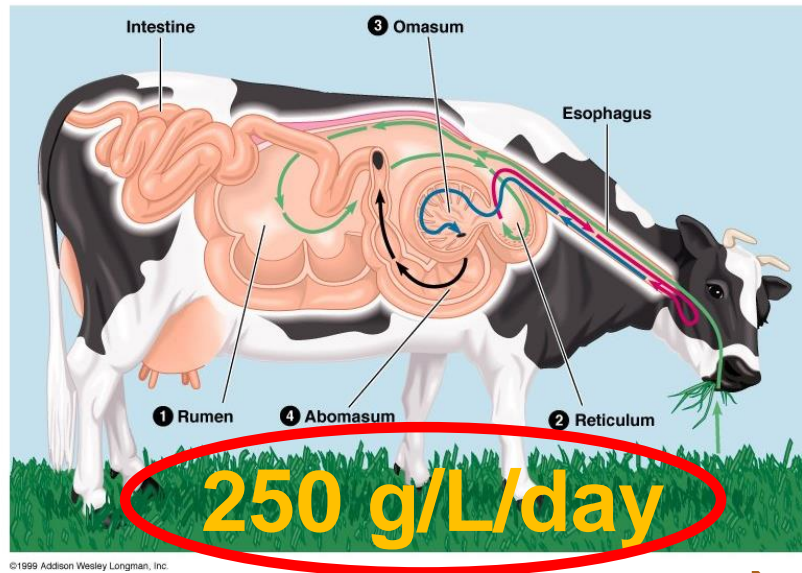
Anaerobic Digestion → Beyond Biogas



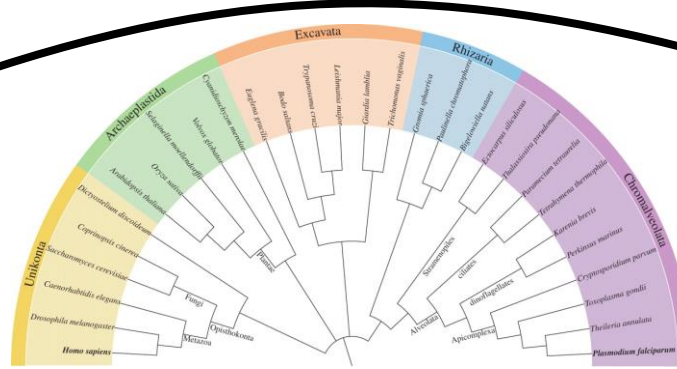
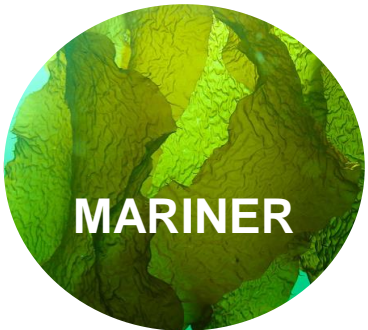
Feedstock



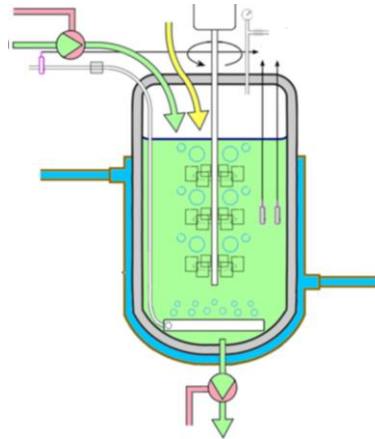
Anaerobic Digestion → Beyond Biogas



Beyond Biogas



**Innovative
Reactor Design**



**Advanced
Understanding &
Control of Microbial
Communities**

**Integrated Product
Separations**

